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I, JONNE YABSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002953368 for a patent by GARFORD PTY LTD as filed on 16 December 2002.



WITNESS my hand this
Eighth day of January 2004

J R Yabsley

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TEAM LEADER EXAMINATION
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APPLICANT:

GARFORD PTY LTD

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AUSTRALIA

THE PATENTS ACT 1990

PROVISIONAL SPECIFICATION FOR THE INVENTION ENTITLED

"A YIELDING ROCK BOLT"

The present invention will be described in the following statement:

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The present invention relates to a yielding rock bolt.

In accordance with one aspect of the present invention there is provided a yielding rock bolt arranged to be inserted into a hole in a rock surface, which comprises a shaft formed of a solid rod, the shaft having a first end and a second end, the shaft having a relatively wide portion adjacent the first end thereof and a relatively narrow portion adjacent the wide portion, an anchor member having a longitudinal bore mounted about the shaft at the relatively narrow portion, the longitudinal bore being of lesser dimension than the relatively wide portion.

The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a yielding rock bolt in accordance with the present invention; and

Figure 2 is a longitudinal cross-sectional view of the rock bolt of Figure 1.

In the drawings, there is shown a yielding rock bolt 10 comprising a shaft 12 and an anchor member 14 mounted about the shaft 12. The shaft 12 is in the form of a solid metal rod. The anchor member 14 has a longitudinal bore 15 as can be seen in Figure 2, which receives the shaft 12. The shaft 12 has a first end 16 and a second end 18. Further, the shaft 12 has a relatively wide portion 20 adjacent the first end 16 and a relatively narrow portion 22 adjacent the wide portion 20 and extending to the second

end 18. The longitudinal bore 15 of the anchor member 14 is dimensioned so that the anchor member 14 can fit over the narrow portion 22 snugly and engage with the inner end of the wide portion 20 as shown in Figure 2. However, the longitudinal bore 15 is of lesser dimension than the wide portion 20.

Further, the shaft 12 is provided with a debonding sheath 24 formed of a suitable material such as plastics material extending along the full length of the shaft 12 apart from the region at which the anchor member 14 is disposed.

The rock bolt 10 is also provided with a rock-face engaging plate 26 adjacent the second end 18 of the shaft 12. The shaft 12 is formed at the second end 18 with a screw threaded portion.

The plate 26 is fitted over the screw threaded portion of the shaft 12. Then a washer 28 is placed over the second end 18 and a threaded nut 30 is then threadedly engaged with the end 18 to retain the plate 26 and the washer 28 in place.

Further, it is envisaged that the shaft 12 will be provided with a stop portion of increased dimension adjacent the first end 16 such as a welded circle 32 formed of relatively hard material inside the sheath 24.

Still further, it is envisaged that a resin mixing paddle 33 may be tack welded to the end 16 of the shaft 12.

Also, the anchor member 14 has a portion 34 which is relatively wide adjacent the wide portion 20 of the shaft 12. Extending towards the second end 18 the anchor member 14 has a portion 36 which tapers inwardly towards the shaft 12 as can best be seen in Figure 2.

The anchor member 14 may be manufactured from heat treated steel such as 41/40 steel heat treated and nitrided to prevent molecular welding between the anchor member 14 and the shaft 12. Thus, it is particularly important that the anchor member 14 be nitrided in the longitudinal bore 15.

In use, a hole is drilled into a wall of a rock face and the first end 16 of the rock bolt 10 is inserted into the hole until the plate member 26 engages with the rock face around the hole. The anchor member 14 is disposed about the shaft 12 adjacent an inner end of the wide portion 20 remote from the first end 16 of the shaft 12 (as can best be seen in Figure 2).

The drilled hole around the rock bolt 10 is then filled with a bonding material such as resin, grout or expansion shells in known manner. The anchor member 14 is secured in place by bonding with the bonding material whilst the shaft 12 is capable of sliding longitudinally within the hole relative to the secured anchor member 14 because of the debonding sheath 24.

If movement of rock causes a portion of the rock face to begin to break away, this portion of the rock face is held in place by the rock bolt 10 being secured at the

anchor member 14. However, this movement will cause the wide portion 20 of the shaft 12 to be pulled through the anchor member 14. The rock bolt 10 therefore yields as the rock face moves preventing the possibility of sudden failure of the rock face. In this movement the wide portion 20 of the shaft 12 being of larger dimension than the longitudinal bore 15 of the anchor member 14 is extruded through the anchor member 14. This provides a predictable and substantially constant force on the anchor member 14.

This force continues until the stop portion 32 engages with the anchor member 14 at which point the force applied to the anchor member 14 is increased considerably because the stop member 32 will not extrude through the anchor member 14. At this the shaft 12 is subjected to maximum load which is the ultimate tensile strength of the shaft 12.

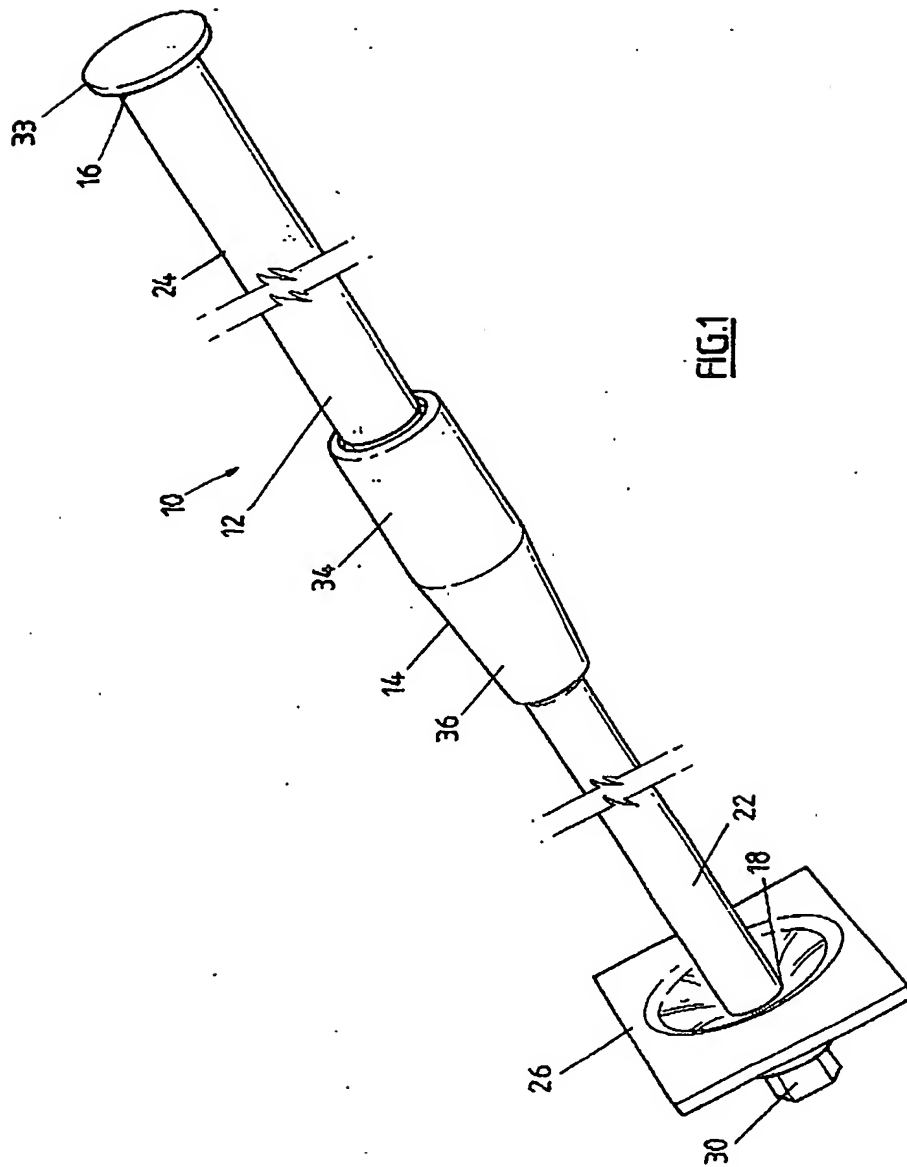
It is envisaged that the yielding rock bolt 10 of the present invention could be manufactured by a number of techniques. In one preferred embodiment the anchor member 14 having a relatively wide bore is disposed about a shaft 14 of uniform dimension throughout its length. The anchor member 14 is then swaged onto the shaft 12 in known manner so as to reduce the dimension of the longitudinal bore and to correspondingly reduce the dimension of the shaft 12 with which the anchor member is engaged. In this embodiment the shaft 12 would only have a narrow portion 22 adjacent the anchor member 14.

In another embodiment it is envisaged that the narrow portion 22 could be formed by taking a solid bar of uniform dimension throughout and then extruding a portion of the bar to form the narrow portion 22 adjacent the second end 18.

Modifications and variations as would be apparent to a skilled addressee are deemed to be within the scope of the present invention

DATED THIS 16TH DAY OF DECEMBER 2002.

GARFORD PTY LTD
By their Patent Attorneys
LORD & COMPANY
PERTH, WESTERN AUSTRALIA



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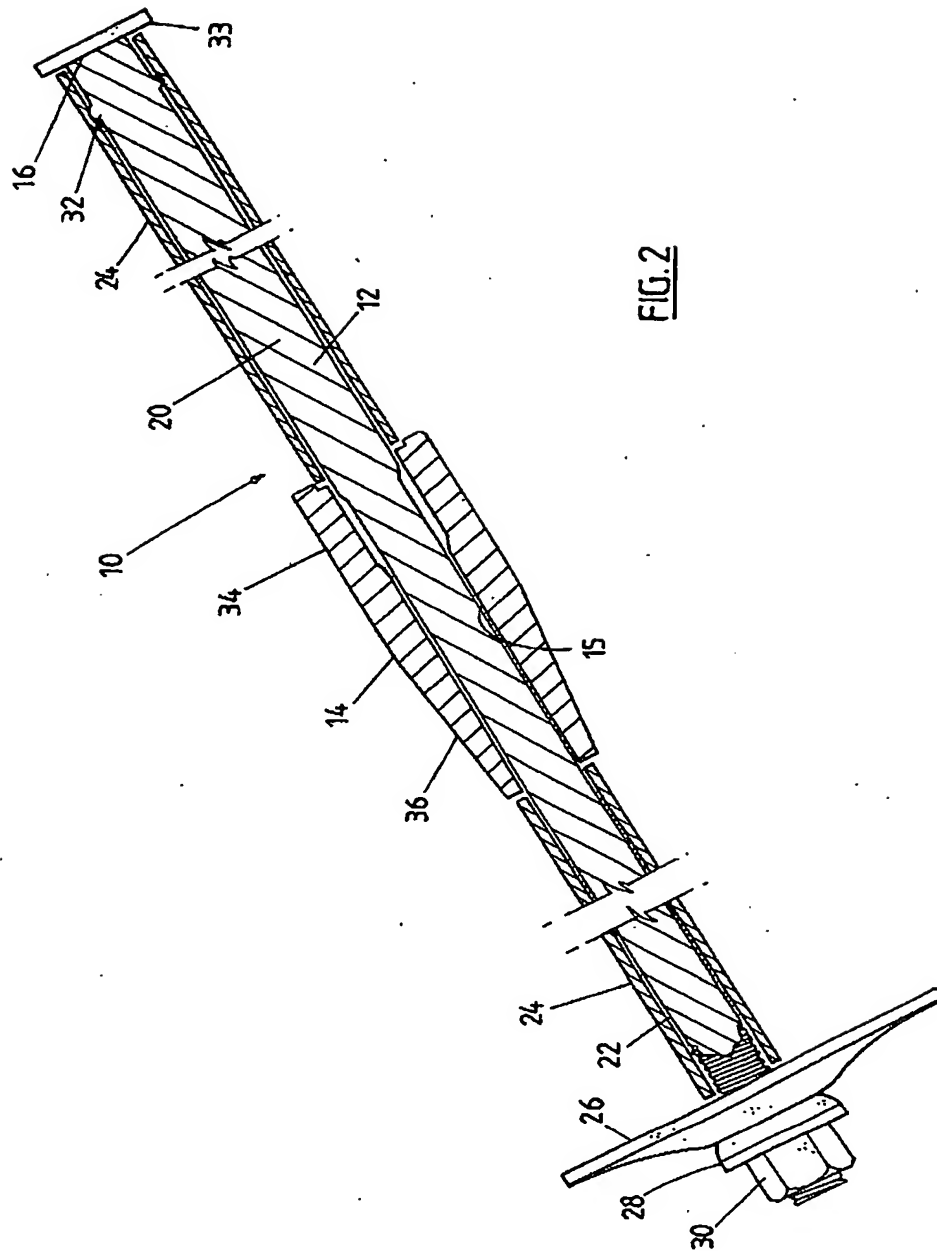


FIG. 2

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